

1567 Evaluation of CalsporinTM (Bacillus subtilis C-3102) on growth performance of nursery pigs. K. Baidoo¹, Q. Yang^{*1}, R.D. Walker¹, T. Marubashi², and T. Mabuyashi², ¹*Southern Research and Outreach Center, University of Minnesota, MN 56093*, ²*Calpis USA Inc., Torrance, CA 90503*.

The objective of this study was to evaluate the use of CalsporinTM as an in-feed additive in the diets of nursery pigs. All diets for sows and piglets were not supplemented with antibiotic. Fifty-two cross-bred sows were allotted to two dietary treatments (1) basal corn-SBM diet; (2) diet 1 + 0.1% Calsporin based on body weight and parity from d 80 of gestation until farrowing. At farrowing, the dietary supplementation of Calsporin was reduced to 0.01%. A total of 144 pigs (BW of 5.5 kg and 21 d of age) were used in a 28-d growth assay. At weaning, treatments were arranged as a 2x2 factorial design with main effects of sows and nursery dietary supplementation. (1) basal-basal; (2) basal-Calsporin; (3) Calsporin-basal; (4) Calsporin-Calsporin with first treatments for sows and second treatment for piglets. For d 0 to 14, pigs in treatment 2 had increased ($P < 0.05$) ADG than pigs in treatment 3 (Table 1). In conclusion, dietary supplementation of Calsporin to sow diets did not influence nursery pig performance, however, adding Calsporin to nursery diets at 100 mg/kg diet improved ADG of pigs.

Table 1. The effect of Calsporin on the Performance of weaned piglets

Sow	Sows fed control diet		Sows fed Calsporin diet		
Treatments	Control	Calsporin	Control	Calsporin	P.
Pig	Control	Calsporin	Control	Calsporin	P.
ADG					
(g, d 0-14)	127.2 ^{ab}	140.2 ^a	103.7 ^b	117.8 ^{ab}	<0.05
Feed/Gain	1.61	1.58	1.69	1.72	NS
ADG					
(g, d 14-28)	387.7 ^b	435.9 ^a	377.8 ^b	428.6 ^a	<0.05
Feed/Gain	1.56 ^a	1.48 ^b	1.59 ^a	1.50 ^{ab}	=0.05
ADG					
(g, d 0-28)	257.4 ^b	288.1 ^a	240.7 ^b	273.2 ^a	<0.05
Feed/Gain	1.58	1.53	1.63	1.60	NS

Note: Means with different superscript in each row are significant ($P < 0.05$).

Key Words: Piglets, Probiotics, Performance

1568 Evaluation of germanium biotite as a substitute for antibiotics in growing pig diets. O. S. Kwon^{*1}, I. H. Kim¹, J. W. Hong¹, S. H. Lee¹, and Y. K. Jung², ¹*Department of Animal Resource & Science, Dankook University,* ²*Seobong Biobestech. Co., Ltd, Korea.*

This study was conducted to evaluate the effect of germanium biotite as a substitute for antibiotics in growing pigs. A total of 54 crossbred pigs (Landrace x Duroc x Yorkshire) initially 32.47 ± 0.9 kg BW were used in this experiment. Pigs were allocated into three treatments. Each treatment had three replicates with six pigs per replicate. This study was carried out for 35 days. The three treatments were negative control (NC: basal diet without antibiotic), positive control (PC: NC diet + 200 ppm chlortetracycline) and GB0.3 (NC diet + germanium biotite 0.3%). ADG and ADFI for pigs fed PC and GB0.3 were higher ($P < 0.05$) than for pigs fed NC. Pigs fed GB0.3 improved ($P < 0.05$) gain/feed compared to NC treatment. DM and N digestibility were significantly different in PC and GB0.3 compared to NC ($P < 0.05$). In conclusion, supplementation of germanium biotite 0.3% in diet has possibility as alternative substances of antibiotics in the diet of growing pigs.

Key Words: Pigs, Biotite, Antibiotics

1569 Effects of an in-feed antibiotic on the morphology of the porcine small intestine. V. Rayadurg^{*}, D.H. Zeman, M.B. Hildreth, and H.H. Stein, *South Dakota State University, Brookings, SD.*

The objective of the current experiment was to assess the effect of the antibiotic (carbadox) on the intestinal morphology. A total of 25 weaning piglets (DH x LYD) were used in the experiment. Pigs were weaned at 21 d and allotted to one of two treatment groups. A phase 1 diet was fed to appetite to the pigs during the entire experimental period. Pigs on treatment group 1 received this diet without any in-feed antibiotic.

Pigs on treatment group 2 received the diet with an antibiotic growth promoter (carbadox) included at 50 ppm. Small intestinal morphology and enterocyte mitotic index was assessed on the d of weaning (d 0), and on d 5 and d 10 of the experiment. Samples taken from the pigs included intestinal tissue obtained from 33%, 66%, and 100% of the length of the small intestine measured from the pyloric sphincter. Computerized morphometry and enterocyte mitotic index was performed on the intestinal sections. Results were analyzed using a three-way factorial analysis. For d 0, the mean villus height (VH) values were higher ($P < 0.05$) than for d 5 or d 10 regardless of the diet being fed post-weaning. Regardless of the site of sampling there was no effect of diet on VH. Within each diet, there was no difference ($P > 0.05$) between mean VH at site 33% and 66%. However, for both diets, VH at both these sites were higher ($P < 0.05$) than at site 100%. On d 0, site 100% had greater crypt depths (CD) than sites 33% and 66% ($P < 0.05$). For diet 1, the CD for site 66% at d 5 were greater than for the other two sites ($P < 0.05$). However, on d 10 site 100% had greater CD than site 66% ($P < 0.05$). For diet 2, CD were greater on d 10 regardless of sampling site. On d 5, pigs fed diet 1 had greater ($P < 0.05$) mean CD values at site 66% than pigs fed diet 2 ($P < 0.05$), but on d 10, pigs fed diet 2 had greater ($P < 0.05$) CD values than pigs fed diet 1. No effects of time, diet, or site were found for the mitotic index. Overall, the results of this experiment demonstrated that VH decreases after weaning while CD increases. An in-feed antibiotic such as carbadox can contribute to an amelioration of the increase in CD.

Key Words: Villus height, Crypt depth, Mitotic index

1570 Utilization of spray-dried egg protein containing specific egg yolk antibodies for weaned pigs. J. W. Hong^{*1}, I. H. Kim¹, O. S. Kwon¹, J. H. Kim², S. H. Lee¹, and J. M. Lee¹, ¹*Department of Animal Resource & Science, Dankook University,* ²*Agribands Purina Korea, Inc., Seoul, Korea.*

For the Exp. 1, thirty six Duroc x Yorkshire x Landrace pigs (6.55 ± 0.10 kg average initial BW and 21 d average age) were used in a 14-d growth assay to determine the effects of replacing spray-dried plasma protein (SDPP) with spray-dried egg protein containing specific egg yolk antibody (SDEP) on growth performance and nutrient digestibility in weaned pigs. Dietary treatments were 0, 3 or 6% SDEP contained 6, 3 or 0% SDPP, respectively. Through entire experimental period, ADG, ADFI and gain/feed tended to decrease as the concentration of SDEP in the diets was increased. However, there were not significant differences among the treatments. As the addition of SDEP in the diets was increased, apparent digestibilities of DM and N were decreased without significant differences. For the Exp. 2, thirty six Duroc x Yorkshire x Landrace pigs (2.63 ± 0.04 kg average initial BW and 10 d average age) were used in a 14-d growth assay to determine the effects of antibiotic replacement with SDEP on growth performance and digestibility in segregated early-weaned pigs. Dietary treatments included 1) CON (corn-dried whey-SBM based diet + 0.08% antibiotic), 2) SDEP 0.5 (corn-dried whey-SBM based diet + 0.5% SDEP), 3) SDEP 1.0 (corn-dried whey-SBM based diet + 1.0% SDEP). ADG and gain/feed of pigs fed SDEP 1.0 diet were higher than pigs fed CON diet without significant difference. Pigs fed the diet with SDEP 1.0 tended to have increased apparent digestibilities of DM and N compared to pigs fed the CON diet without significant differences. In conclusion, the SDEP supplementation seemed to be partial replacing the SDPP portion of high nutrient dense diet and to be approximately 1.0% or more when the pigs fed the antibiotic-free diet for early-weaned pigs.

Key Words: Animal protein, Egg yolk antibody, Pigs

1571 Dietary effect of egg immunoglobulins containing anti-pathogenic antibodies to pre- and postweaning pigs on growth performance till market weight. C. Y. Liu^{*1}, B. J. Chang¹, G. Y. Lee¹, and Y. Kodama², ¹*Animal Technology Institute Taiwan, ROC,* ²*Immunology Research Institute, Japan.*

Two experiments were conducted to evaluate the effect of feeding egg immunoglobulins (Ig) containing anti-pathogenic antibodies to pre- and postweaning pigs on growth and subsequent performance till market weight. In Exp. 1, 20 litters of 14-day old piglets (8 pigs/litter) were fed either a control or Ig supplemented diet, in which Ig was obtained from laying hens immunized with ETEC K88, K99, 987P, porcine rotavirus and PED virus, at 4.0% for 14 days before weaning and at 0.2% for 28 days after weaning. Diets supplemented with Ig significantly ($P < 0.01$)

increased ADG during both pre- (205 vs 226 g/d) and postweaning (375 vs 414 g/d) periods. Postweaning F/G was also improved by Ig (1.74 vs 1.64, $P < .05$). In Exp. II, 20 litters of preweaning piglets (14 days of age, 8 pigs/litter) were fed a diet with or without anti-ETEC K88 and K99 Ig antibodies at 0.5% for 14 days before weaning and at 0.035% for 28 days after weaning. Dietary Ig supplement improved ($P < .05$) ADG by 7.1% (269 vs 288 g/d) and 14.2% (393 vs 449 g/d) for pre- and postweaning period, respectively, as well as postweaning F/G (1.62 vs 1.47, $P < .01$). Subsequently, the growth performance (Exp. II) remained superior in Ig-fed group from 20 kg to market weight (ADG: 747 vs 801 g/d, $P < .01$; ADFI: 2242 vs 2323 g/d, $P > .05$; F/G: 3.00 vs 2.90, $P < .05$). Since less diarrhea and lower mortality were observed in Ig-fed young pigs, these results demonstrate that feeding anti-pathogenic antibodies to weaning pigs can protect pigs from infection and improve growth performance till growing-finishing phase.

Key Words: Pigs, Immunoglobulin, Performance

1572 Effects of dietary bacterial biodegradation velocity and electrolyte balance on nutrient digestibility, retention, and excretory patterns in finishing pigs. Z. Mroz^{*1}, A. J. Moeser², J. Th. M. van Diepen¹, and J. Kogut¹, ¹Institute for Animal Science and Health, Lelystad, The Netherlands, ²North Carolina State University, Raleigh, NC, USA.

Effects of dietary bacterial biodegradation velocity (BBV) and electrolyte balance (dEB=Na+K-Cl) were investigated with ten ileal cannulated pigs of 60 kg BW, according to a balanced row-column design. The BBV is a measure of dietary fermentative potential expressed in time (h) needed for a progressive anaerobic gas production (in vitro). Ten diets were formulated of barley, wheat, tapioca, soybean meal, corn products, soybean hulls, beet pulp, and K₂CO₃ to obtain two levels of dEB (180 and 360 mEq/kg), each with five BBV times (7.7, 9.2, 9.4, 10.6, and 12.1 h). Daily energy allowance (2.4 x ME_m) was given in two wet meals (3 L of water per 9.2 MJ NE_g). No interactive effects of BBV and dEB were found, irrespective of the response parameter. Daily production of feces and urine was affected ($P < .05$) by BBV, and not by dEB. With a longer BBV time, more feces and less urine were excreted. Apparent digestibility (ileal/overall) of DM, OM, and CP diminished ($P < .05$) with increasing BBV time, whereas no effect of dEB (except for ash) was found. Body N retention was not affected by BBV, whereas it tended ($P = 0.068$) to be greater in pigs fed low dEB. Daily amounts of fecal N were greater ($P < .001$) with increasing BBV time, whereas urinary losses of N were similar. Reduced dEB tended to lower urinary N ($P = 0.082$), and to increase N retention ($P = 0.068$). Ratios of urinary to fecal N were affected by BBV ($P < .001$), and prolonging BBV time from 7.7 to 12.1 h resulted in "shifting" 28% of urinary N (easy degradable) into fecal bacterial N (less degradable). Thereby, a velocity of indoor ammonia volatilization could be slowed down.

Key Words: Pigs, Dietary fermentative velocity, Nutrient balance

1573 Effects of in-feed acidifiers for multiparous sows. Z. Mroz^{*1} and W. Krasucki², ¹Institute for Animal Science and Health, Lelystad, The Netherlands, ²Agricultural University of Lublin, Lublin, Poland.

Two in-feed acidifiers in graded doses were used for sows to study reproductive responses, nutrient digestion, and the inhibition of bacteriuria, lactation failure (PHS), and ammonia emission from manure. In Exp. 1, 32 multiparous sows of 150 kg BW were fed a cereal-soybean meal-rapeseed meal-based diet with 0.0, 0.3, 0.6, and 0.9% of blended propionic and formic acids (1:3) over one reproductive cycle. In Exp. 2, 24 pregnant sows of 180 kg BW received a basal diet with Na-benzoate (0.0, 0.2, 0.4, and 0.8%) at free access to water. No PHS was noted in both experiments. In Exp. 1, sow's BW changes in pregnancy or litter size/weight at birth were similar ($P > .05$) among the groups. Lactating sows tended ($P < .01$) to increase milk production at greater ($P < .05$) contents of fat and PUFA (except for C18:3). Also, piglet's BW at weaning, and the ileal digestibilities of lysine, cystine, and histidine in lactation diets were improved ($P < .05$). In Exp. 2, voluntary feed intakes and growth rates were similar ($P > .05$) among the groups. Sodium-benzoate at the highest dose reduced ($P < .001$) urinary bacterial populations (from 10⁶ at mating to less than 10³ at farrowing), urine pH (by up to 2.2 units), and ammonia emission from manure (by up to

43.2%). These data imply that acidifiers for sows may inhibit periparturient hypogalactia syndrome, bacteriuria, and(or) ammonia emission from manure.

Key Words: Sows, Acidifiers, Bacteriuria

1574 The interaction between lactofeed level and soybean meal on growth performance of weaning pigs. J. V. O' Doherty^{*1}, C. S. Nolan¹, J. J. Callan¹, and P. McCarthy², ¹University College Dublin, Ireland, ²Volac International, UK.

A 3 x 2 factorial experiment was conducted to investigate the interaction between lactofeed 70 (LF70) (800 g/kg lactose, 200 g/kg soybean meal, Volac International, UK) levels and soybean meal inclusion (SBM) (9% and 22.5%) from d 0 to d 25 (starter period) after weaning on growth performance and diet digestibility. A common diet was fed from d 26 to d 38. Dietary treatments were established by substituting LF70 for extruded wheat and soybean meal for potato protein (PP) and soy protein concentrate (SPC). Digestible energy and amino acids were maintained by adjusting soy oil and synthetic amino acids. A total of 248 pigs (initially 7.3 kg and 25 +/- 4 d of age) were allotted randomly to 6 treatments containing (1) 0 LF70 with 4% PP and 4% SPC (2) 0 LF70 with 22.5% SBM (3) 17.5% LF70 with 4% PP and 4% SPC (4) 17.5% LF70 with 22.5% SBM (5) 35% LF70 with 4% PP and 4% SPC and (6) 35% LF70 with 22.5% SBM. There was an increase in average daily gain (ADG) (0.182 vs 0.292 vs 0.318 kg, sem 0.0089; $P < 0.001$), feed intake (0.413 vs 0.472 vs 0.489 kg, sem 0.0139; $P < 0.01$) and feed efficiency (FE) (2.12 vs 1.55 vs 1.49 kg, sem 0.057; $P < 0.001$) as the level of LF70 increased during the starter period. From d 26 to d 38, the pigs fed the starter diets containing 0% LF70 had an improved ADG ($P < 0.05$) and FE ($P < 0.001$) compared to the pigs fed 17.5 and 35% LF70. There was an increase in live weight (18.1 vs 20.2 vs 21.1 kg, sem 0.335; $P < 0.001$) at d 38 as the level of LF70 increased. There was an interaction between LF70 and SBM in the apparent digestibility of gross energy (GED) and nitrogen (ND). Pigs fed higher SBM diets had a higher GED ($P < 0.01$) at the 35% LF70 inclusion than pigs fed PP and SPC diets. However, there was no difference in GED at the 0 and 17.5% LF70 inclusion. Pigs fed higher SBM diets had a higher ND ($P < 0.05$) at the 35% LF70 inclusion than pigs fed PP and SPC diets. However, at 0 and 17.5% inclusion the pigs fed the higher SBM had a decreased ND ($P < 0.05$) compared to the pigs fed PP and SPC diets. In conclusion, the inclusion of LF70 increased ADG, feed intake and FE.

Key Words: Piglets, Lactofeed, Soybean

1575 Interaction between lactofeed level and antimicrobial growth promoters on growth performance of weaning pigs. J. V. O' Doherty^{*1}, C. S. Nolan¹, and P. McCarthy², ¹University College Dublin, ²Volac International, UK.

In experiment 1, 184 pigs (initially 8.85 kg and 28 +/- 2 d of age) were used in a 2 x 2 factorial arrangement of treatments to investigate the interaction between lactofeed (LF70) (800 g/kg lactose, 200 g/kg soybean meal, Volac International, UK) level (17.5% and 35%) and avilamycin (0 and 200 ppm of maxus, Elanco Animal Health) inclusion in piglet starter diets. Pigs were fed starter diets from d 0 to d 22 and a transition diet was fed from d 23 to d 39. The inclusion level of LF70 in the transition diet was 7.5% and 15%. Pigs fed 35% LF70 had a higher ADG ($P < 0.05$) during the starter period than the pigs fed 17.5% LF70. Pigs fed medicated diets had a higher ADG ($P < 0.01$) and an improved feed efficiency (FE) ($P < 0.05$) compared to the non medicated fed pigs. There was an increase in feed intake (AFI) ($P < 0.05$) during the transition period with increasing levels of LF70. There was an improvement in FE during the transition period with the inclusion of maxus ($P < 0.005$). There was a significant interaction ($P < 0.01$) between LF70 and maxus for ADG during the transition period. The inclusion of maxus at 17.5% LF70 inclusion had no effect ($P > 0.05$) on ADG. However at 35% LF70 inclusion the pigs offered medicated diets had a higher ADG ($P < 0.001$) compared to non medicated diets. In experiment 2, 184 pigs (initially 8.85 kg and 28 +/- 2 d of age) were used in a 2 x 2 factorial to investigate the interaction between LF70 level (17.5% and 35%) and zinc oxide (ZnO) (0 and 3.1 kg/metric tonne) inclusion in piglet starter diets. The inclusion level of LF70 in the transition diet was 7.5% and 15% and ZnO was 2 kg/metric tonne. There was a significant increase ($P < 0.05$) in ADG and an improvement in FE with increasing levels of LF70 during the starter period. The inclusion of ZnO during the starter period resulted in an increase ($P < 0.05$) in ADG and FE compared to

Test Results: GLOBIGEN Piglet I

Test 1:

Use of GLOBIGEN Piglet I in 4 Problem farms in Germany

Dose: 250g per 1to Baby Starter

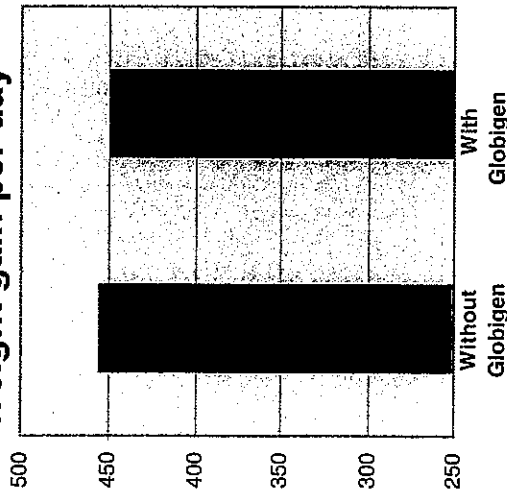
Period of use: 3 Weeks after weaning

Results:

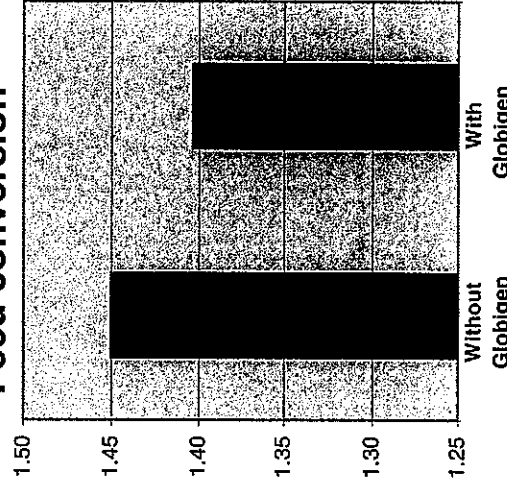
Group	Number of piglets	Start weight (Kg)	End weight (Kg)	Weight gain p.D.	Feed conversion
Controll	139	8.23	27.47	455	1.45
GLOBIGEN	98	7.70	27.07	449	1.40

237

Weight gain per day



Feed conversion



*In the Test group no diahrea problems and losses where seen!
As a result no antibiotic treatment was nessesary!*

Test 2:

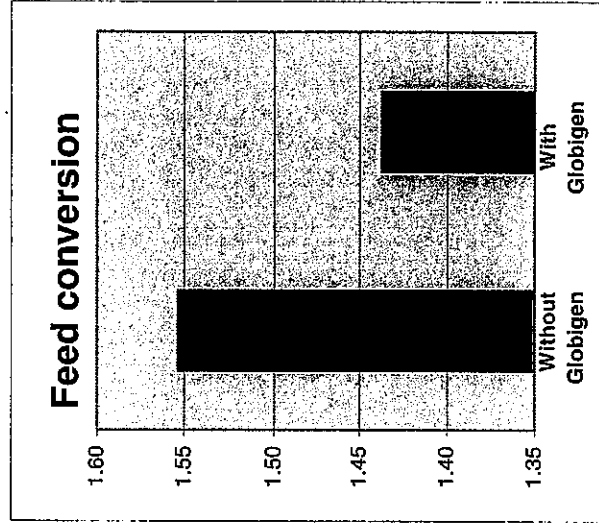
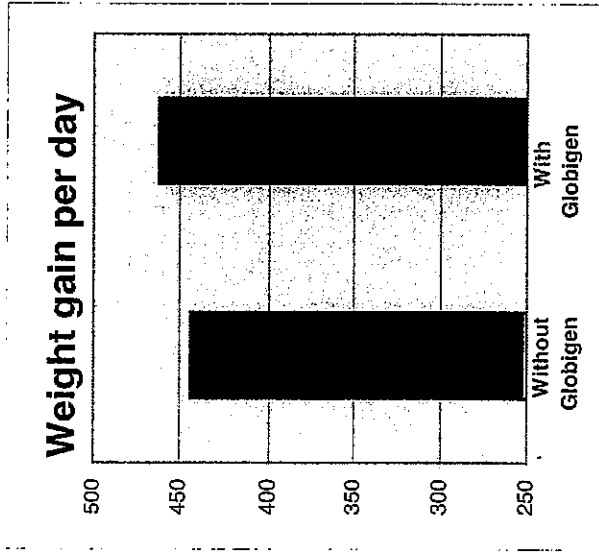
Use of GLOBIGEN Piglet I in a test against a competitor feed

Dose: 250g per 1 to Piglet feed during the Piglet rearing period

Results:

Group	Number of piglets	Start weight (Kg)	End weight (Kg)	Weight gain p.D.	Feed conversion
Competition	60	8.92	27.71	444	1.55
GLOBIGEN	60	8.92	27.90	462	1.44

120



Feed cost comparison per kg Weight gain:

Competitor 0.46

GLOBIGEN 0.40

(Incl. GLOBIGEN costs)

!! Over 1.00 Advantage per Animal !!

Test 3:

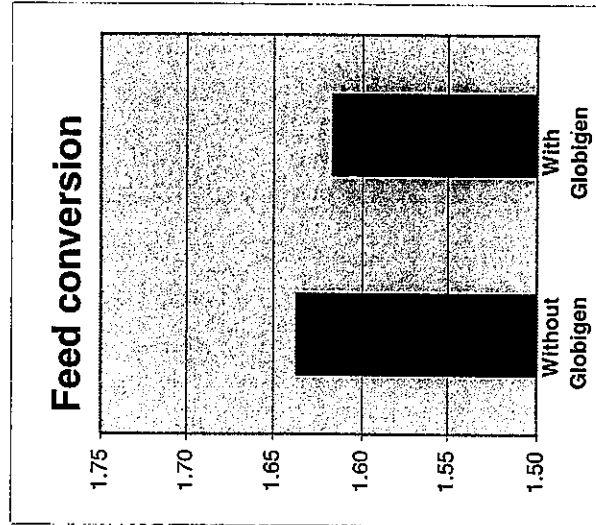
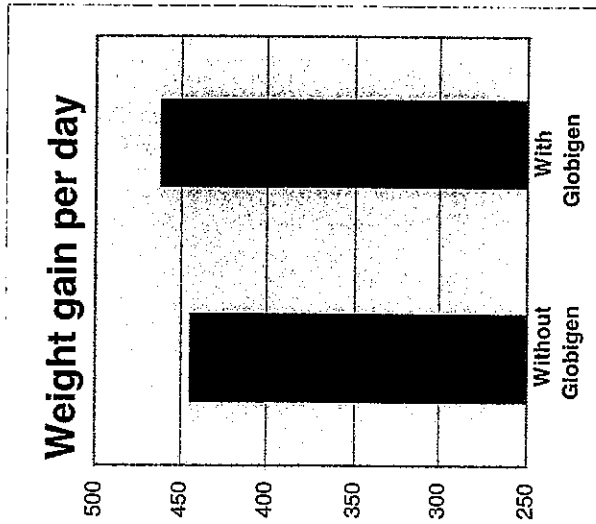
Use of GLOBIGEN Piglet I in a problem farms in Belgium

Dose: 250g per 1 to Piglet feed during the Piglet rearing period

Results:

Group	Number of piglets	Start weight (Kg)	End weight (Kg)	Weight gain p.D.	Feed conversion
Control	85	9.22	20.30	419	1.64
GLOBIGEN	80	8.27	20.09	445	1.62

165



During the whole Test period no diarrheah problems where seen.

Test 4:

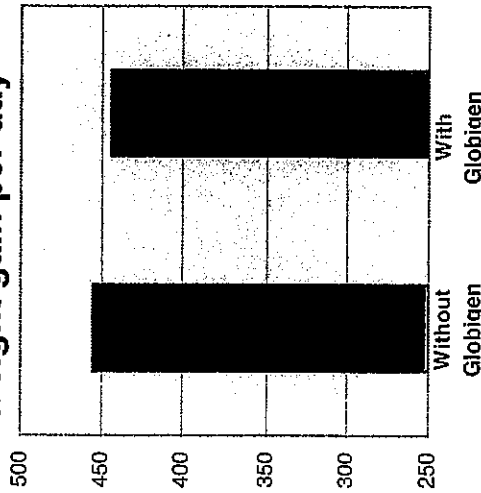
Use of GLOBIGEN Piglet 1 in a rearing unit for PS-breeding sows
Dose: 250g per 1 to Baby Starter
Period of use: 3 Weeks after weaning

Results:

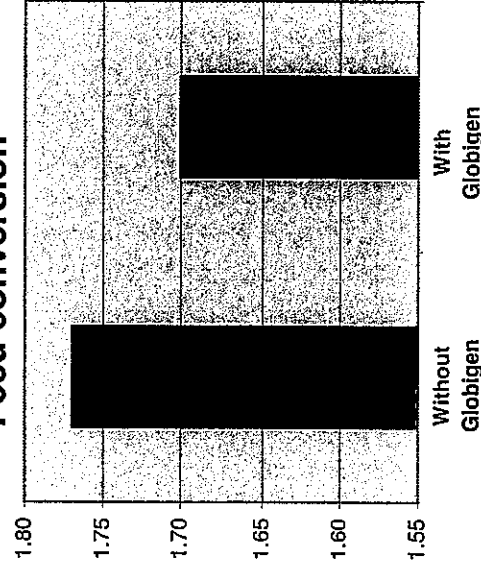
Group	Number of piglets	Start weight (Kg)	End weight (Kg)	Weight gain p.D.	Feed conversion
Control	302	6.20	30.40	455.4	1.77
GLOBIGEN	256	6.20	30.00	444.4	1.70

558

Weight gain per day



Feed conversion



While the control group needed to be treated during the first 21 days after weaning the medication cost where 137 ¢ (or 0,45 ¢ per piglet) higher then in the GLOBIGEN Group, while the GLOBIGEN costs only made up 57 ¢ (or 0,223 ¢ per Animal)

Test results:

GLOBIGEN Piglet II

Test 1:

Use of GLOBIGEN Piglet II in a Oedem problem heard
 Dose: 250g per 1to of Piglet feed
 Period of use: Starting in the 3. Week after weaning

Before using GLOBIGEN the average mortality was between 3 and 8%

Results:

Group	Number of piglets	Start weight (Kg)	End weight (Kg)	Weight gain p.D.	Feed conversion
Durchgang 1 with GLOBIGEN	1010	6.50	32.30	470	1.63
Durchgang 2 with GLOBIGEN	777	6.40	31.40	471	1.63
	1787				

In the test group no Oedem problems where seen!

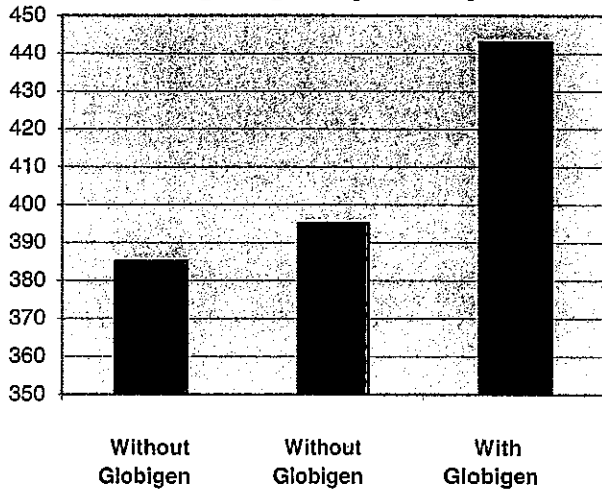
Test 2:

U of GLOBIGEN Piglet II in a Oedem problem heard
 Dose: 250g per 1to of Piglet feed
 Period of use: Starting after weaning

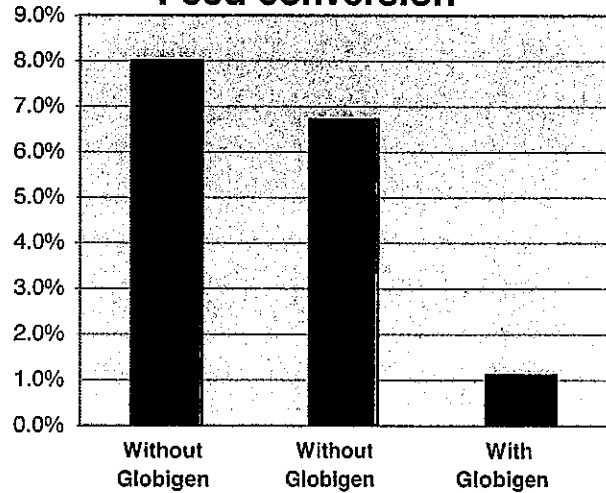
Results:

Group	Number of piglets	Start weight (Kg)	End weight (Kg)	Weight gain p.D.	Feed conversion
Without GLOBIGEN	180	6.60	27.00	385	8.0%
Without GLOBIGEN	179	6.25	28.00	395	6.7%
With GLOBIGEN	180	6.80	28.50	443	1.1%
	539				

Weight gain per day



Feed conversion



Additional trial have shown that with the use of GLOBIGEN Piglet II the Oedemproblems where solved.